Experiments Beyond the Tonne-Scale: New Technologies

An Instrumentation Perspective

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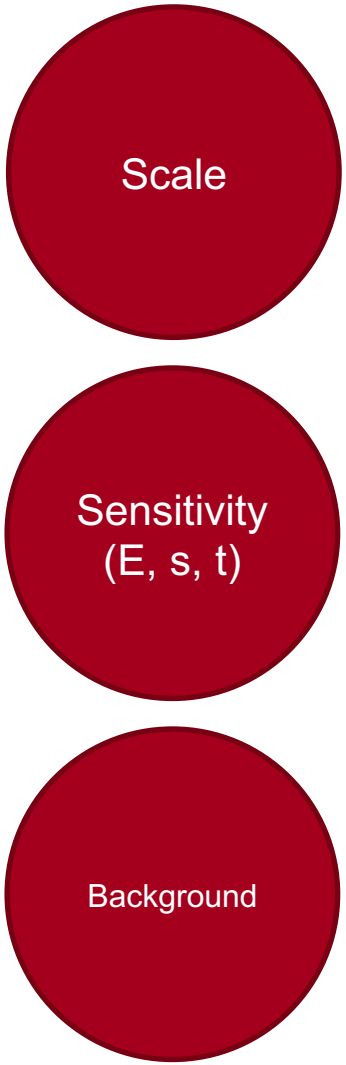
What questions we need to answer?

Needs



- Large channel counts = interconnections = points of failure
  - Can we aggregate data inside the vessels?
  - Can we build radiopure readouts?
  - Can we keep power consumption contained and operate in a cold environment?
- Lower noise / high precision timing
  - What are the implications of increasing dynamic range?
  - Can we increase the power budget for front-ends?
- Multi-sensing approaches / Active background rejection techniques
  - Can we leverage them to extract information in real time?
  - Triggered readouts

A few points for discussion

- Application Specific Integrated Circuits have enabled high channel count and data aggregation in large experiments
  - IC technology are relatively radiopure as bare die, but we need data
  - We know how to design at cold temperatures, but we need models
- System-on-chip architectures are critical
  - Self-consistent designs with minimal I/Os
    - Integrated capless LDOs, Low power signal processing chains, high speed serializers
- Lower noise / precision timing / high dynamic range (ADC bits) can be achieved
  - Trade-off with power
  - Trade-off with bandwidth (thus sampling frequency and the possibility to resolve more features in the pulse shape for events discrimination
- Triggered acquisitions could solve power consumption issues, reduce dramatically interconnections, allowing to allocate more power in the front-ends to increase sensitivity and higher sampling rates around triggering events.